

Major Petroleum Facility and Central Steam Facility

Facility Environmental Monitoring Report

Calendar Year 2004



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Summary of Results

Analysis of environmental samples collected at the Major Petroleum Facility and Central Steam Facility during 2004 indicates that current operations are not impacting air or groundwater quality.

No fuel-related chemicals were detected in the groundwater at the Major Petroleum Facility. However, as in 2002 and 2003, low levels of the chemicals tetrachloroethylene and 1,2-dichloroethene continue to be detected in one well at concentrations exceeding New York State water quality standards. These contaminants are not associated with current operations and probably originate from historical solvent spills near the Central Steam Facility.

Continuous emission monitoring data and No. 6 fuel oil analytical sample results collected during 2004 confirm that the four boilers at the Central Steam Facility were fully compliant with applicable nitrogen oxide (NO_x) emission standards and with NYSDEC operating permits. All of the periodic exceedances of the opacity standard, measured by the continuous opacity monitor for Boiler 7 occurred during boiler start-ups and routine boiler maintenance intervals. BNL self-disclosed these permit deviations to the NYSDEC, and no fines or penalties were levied.

Conformance with the particulate emissions limit defined in BNL's Title V Permit is presumed so long as measured sulfur content of residual oil burned in the boiler does not exceed 0.3 % by weight. During the third quarter, the measured sulfur content of a residual oil sample collected was 0.409% by weight. BNL's fuel contract for purchases of residual oil had permitted the delivery of residual oil with sulfur content up to 0.3% by weight. BNL self-disclosed this permit deviation to the NYSDEC, and no fines or penalties were levied.

In 2004, there were no SPDES permit excursions attributable to CSF/MPF activities. The Laboratory revised the draft remedial action plan for remediating lead contaminated soils at the Central Steam Facility storm water outfall, and incorporated new data collected with the SCDHS. The plan was resubmitted to the regulatory agencies in March. There have been no comments received from the agencies to date. During routine SPDES monitoring the SCDHS collected soil samples overlying the geotextile fabric and found them to contain elevated levels of lead. The contaminated soil is likely flushing out of upstream manholes. Plans are being made to remove the contaminated media from the manholes and prevent future release.

Background

The Major Petroleum Facility (MPF) is the holding area for fuels used at the Central Steam Facility (CSF). Fuel oil for the CSF is held in a network of seven aboveground storage tanks. The tanks, which have a combined capacity to contain up to 1.7 million gallons of #6 fuel oil and 660,000 gallons of #2 fuel oil, are connected to the CSF by aboveground pipelines that have secondary containment and leak detection devices. All fuel storage tanks are located in bermed containment areas that have a capacity to hold >110 percent of the volume of the largest tank located within each bermed area. The bermed areas have bentonite clay liners consisting of either Environmat (bentonite clay sandwiched between geotextile material) or bentonite clay mixed into the native soils to form an impervious soil/clay layer. As of December 1996, all fuel unloading operations were consolidated in one centralized building that has secondary containment features. The MPF is operated under New York State Department of Environmental Conservation (NYSDEC) license #1-1700. As required by law, a Spill Prevention Control and Countermeasures Plan and a Facility Response Plan have been developed for the facility (BNL, 2000; BNL, 2002b).

The CSF uses four boilers to supply steam for heating and cooling to major BNL facilities through an underground steam distribution and condensate grid. To control emissions of nitrogen oxides (NO_x), a pollutant that contributes to the formation of ozone in the lower atmosphere, both USEPA and NYSDEC have enacted regulatory requirements that restrict NO_x emissions from large and midsize boilers. The CSF uses a combination of engineering and administrative controls to comply with applicable NO_x emission standards.

For Boilers Nos. 1A and 5, compliance with the NO_x emission standard of 6 NYCRR Part 227-2 is achieved through the use of low-excess air burners. Initial compliance with this standard was demonstrated through stack testing conducted in January 1995 while each boiler burned No. 6 oil with fuel nitrogen and sulfur contents of less than 0.3 percent. To help to ensure compliance with the NO_x limits, all CSF contracts with No. 6 oil suppliers specify that No. 6 oil delivered to the MPF have a nitrogen content not greater than 0.3 percent by weight.

In addition to the emission limits of 6 NYCRR Part 227-2, Boiler Nos. 6 and 7 must comply with NO_x emission limits of New Source Performance Standard, 40 CFR 60 Subpart Db. Boiler No. 7 must also comply with the 40 CFR 60 Subpart Db particulate emissions standard and with stack opacity monitoring requirements. Both boilers use dual fired low NO_x burners to meet the NO_x emission standards. To demonstrate initial compliance with the Subpart Db NO_x standard, stack tests were conducted on Boilers 6 and 7 in October 1991 and May 1996 respectively. Initial compliance with the particulate emissions standard was demonstrated via stack testing of Boiler 7 in December 1996 while residual oil with a sulfur content of 0.29% wt was burned. In accordance with Subpart Db requirements, NO_x continuous emission monitors are used on both boilers and a continuous opacity monitoring system is used on Boiler 7 to ensure continuous compliance with the NO_x and opacity standards.

Environmental Monitoring Program

BNL has established air, groundwater, and stormwater discharge monitoring programs at the CSF and MPF to evaluate potential impacts to environmental quality and to demonstrate compliance with DOE requirements and applicable federal, state, and local laws, regulations, and permits. Monitoring requirements are described in the NYSDEC License and summarized in the *BNL Environmental Monitoring Plan* (BNL, 2004a).

Monitoring Results

Air

The primary objective of air monitoring efforts at the CSF is to verify compliance with applicable federal and state NO_x emission and opacity standards. This is accomplished either through periodic monitoring of residual fuel deliveries to the MPF, surveillance monitoring of visible stack emissions from Boilers 1A, 5 and 6, or continuous monitoring of NO_x and opacity emissions through monitoring ports in stacks for Boilers 6 and 7. Monitoring results were provided to NYSDEC on a quarterly basis (Goode, 2004a; Goode, 2004c; Goode, 2004d; Goode, 2005).

Since there are no continuous emissions monitoring requirements for Boilers 1A and 5, the CSF uses the measured nitrogen content from composite samples of No. 6 fuel deliveries to the MPF during the quarter as a surrogate indicator for compliance with NO_x emission standards. Continued compliance with the emission standard is presumed so long as laboratory analysis of composite residual fuel samples confirms the fuel nitrogen content does not exceed 0.3 percent by weight. Analysis of composite samples of residual fuel oil deliveries to MPF storage tanks during each quarter of CY 2004 confirmed that the fuel bound nitrogen content of No. 6 oil burned at the CSF was less than 0.3 percent by weight.

While there are no regulatory requirements for continuous monitoring of opacity for Boilers 1A, 5, and 6, surveillance monitoring of visible stack emissions is conducted daily by CSF personnel. During 2004, there were five instances when this daily check was not conducted. Daily observations of stack gases recorded throughout the year in accordance with conditions of BNL's Title V operating permit showed no visible emissions with opacity levels exceeding regulatory limits established for these boilers.

From May 1 to September 15 (the peak ozone period), compliance of Boilers 6 and 7 with the NO_x emissions limits was demonstrated by calculating the 24-hour average emission rate from continuous emission monitor readings, and comparing this value to the emission standards (0.30 lbs/MMBtu for oil and 0.20 lbs/MMBtu for gas). For the remainder of the year, the calculated 30-day rolling average emissions rate was used to establish compliance. In CY 2004, there were no measured exceedances of the NO_x emission standard for either boiler. For the year, NO_x emissions from Boiler 6 averaged 0.256 lbs/MMBtu when No. 6 oil was burned, and 0.113 lbs/MMBtu when No. 2 oil was burned, and 0.070 lbs/MMBtu for natural gas. Similarly, the annual average NO_x emissions recorded by the continuous emission monitors on Boiler 7 when No. 6 oil, No.

2 oil, and natural gas were burned were 0.210 lbs/MMBtu, 0.071 lbs/MMBtu, and 0.200 lbs/MMBtu, respectively.

Boilers 6 and 7 flue gas opacity is measured by transmissometers mounted on the individual stacks above the CSF roofline. Opacity readings are taken at 15-second intervals and reported as 6-minute averages. Measured opacity levels cannot exceed 20 percent opacity, except for one 6-minute period per hour of not more than 27 percent opacity. With the exception of two unexplained six-minute periods observed on November 1st and December 29th, all of the excess opacity measurements recorded for the year by the Boiler 6 transmissometer and all excess opacity measurements recorded for the year by the Boiler 7 transmissometer occurred during boiler start-ups, or during routine boiler tube soot blowing operations.

Permit Deviation Related to Boiler 7 Combustion of Residual Oil: Conditions 1-9 and 63 of BNL's Title V Permit specify that particulate emissions from Boiler 7 shall not exceed the total suspended particulate emission limit of 0.10 lbs/MMBtu established by 40 CFR Subpart Db Section 60.43b(b). Aside from periodic stack tests that must be conducted once during the 5-year term of BNL's Title V Permit, conformance with the particulate emissions limit is presumed so long as measured sulfur content of residual (Number 6) oil burned in the boiler does not exceed 0.3% by weight. During the third quarter, the measured sulfur content of a residual oil sample collected was 0.409 % by weight. BNL's fuel contract for purchases of residual oil had permitted the delivery of residual oil with sulfur content up to 0.3% by weight. This shipment was intended for another facility, but was delivered to BNL by mistake. BNL self-disclosed this permit deviation to the NYSDEC, and no fines or penalties were levied.

Groundwater

The MPF's groundwater monitoring program is designed to confirm that the engineered and institutional controls are effective in preventing contamination of the aquifer. During 2004, groundwater quality in the MPF area was monitored using eight wells (076-16, 076-17, 076-18, 076-19, 076-25, 076-378, 076-379, and 076-380). The locations of the monitoring wells are shown on Figure 1.

Groundwater contaminants from the fuel oil products stored at the MPF can travel both as free product and in dissolved form with advective groundwater flow. Historically, the Special License Conditions for the MPF required the groundwater monitoring program to include semiannual sampling for semivolatile organic compounds (SVOCs) and monthly monitoring for floating petroleum. In 2002, NYSDEC expanded the required analysis list for the MPF wells to include volatile organic compounds (VOCs), including the gasoline additive MTBE. Prior to 2002, BNL had periodically tested the MPF wells for VOCs because of historical solvent and fuel oil spills that had occurred in the area.

BNL sampled the MPF wells in April and October 2004. The samples were tested for SVOCs and VOCs. As in the past, no SVOCs were detected, and no floating product was observed (Goode, 2004b; Goode, 2004e). However, several solvents continued to be

detected in well 076-380 at concentrations exceeding the typical New York State Ambient Water Quality Standard of 5 µg/L (or 5 parts per billion). Tetrachloroethylene (PCE) was detected at concentrations up to 33 µg/L, and trichloroethylene was observed up to 6.9 µg/L (Figure 2). Compared to 2002, when trans-1,2-dichloroethene was detected in well 076-380 up to 566 µg/L, this compound was not detected during 2004. These solvents are believed to have originated from documented historical spills near the CSF building, and their presence in groundwater is not the result of current CSF or MPF operations.

SPDES Monitoring

In 2004, there were no SPDES permit excursions attributable to CSF/MPF activities. Stormwater from the MPF/CSF area is discharged to an outfall located approximately 900 feet east of Bldg. 610. This discharge is regulated under the BNL State Pollutant Discharge Elimination System (SPDES) permit, as Outfall 010. This discharge point receives stormwater runoff from the area around the CSF, North Sixth Street east of the CSF, and Cornell Avenue north of the CSF. Historical surveillance monitoring of the discharge revealed sporadic detections of lead above the NYS groundwater discharge standard of 50 µg/L.

In 2000/2001, an area of lead contaminated soils was discovered at the outfall. Resuspension of the contaminated soils at the outfall during sample collection was identified as the probable cause for the periodic discharge violations. In February 2002, NYSDEC added lead monitoring as a condition of the BNL SPDES permit for this outfall. During 2002, the effluent standard for lead was exceeded on two occasions. Evaluation of the effluent sample collection process indicated that re-suspended contaminated soils might have been entrained in the samples during collection, resulting in erroneously high lead concentrations. To mitigate this, a geotextile was installed at the outfall to prevent resuspension of contaminated soils. Based on subsequent effluent analyses, the textile has been successful in preventing the resuspension of contaminated soils, and has allowed for the collection of more representative effluent samples.

The Laboratory received a modified SPDES permit in February 2004 that contained revised sampling requirements for Outfall 010. The NYSDEC had approved the Laboratory's petition to change the requirement for metals sampling at Outfall 010 from total concentration to a dissolved concentration. Through the collection of filtered and unfiltered samples it was shown that the elevated lead concentrations in total or unfiltered samples was due to resuspended sediment because filtered samples had considerably lower concentrations. Since the change in requirements, the lead concentrations measured at Outfall 010 have been reduced, and there were no SPDES violations for lead during 2004.

In 2003, an additional field investigation was conducted in response to concerns expressed by the SCDHS to verify the extent of lead contamination. This activity included collection of additional soil samples in areas previously characterized with single point samples. Due to an obvious flow channel, additional soil samples were not originally conducted. Sampling of soils within five feet of the original sample location

showed all levels to be less than 400 ppm, which confirmed the original assumption that the contaminated soils did not extend far from the original sample point. The SCDHS also requested that the clean-up objective be lowered from 1,200 ppm to 400 ppm. The original objective was based upon a residential soil standard documented in Part 703 of the Toxic Substances Control Act. Based upon County concern the objective was lowered to 400 ppm, which is the EPA and NYSDEC recognized cleanup standard for residential soils. The extent of soil contamination that requires cleanup is shown in Figure 3. The results from the supplemental investigation and the revised cleanup objective were documented in a revised remedial plan that was submitted to the regulatory agencies for review in March 2004. No comments to the revised remedial action plan have been received to date. During collection of SPDES samples in early 2005, the SCDHS collected samples of soil that had accumulated on top of the geotextile fabric. Chemical analysis of the soils showed that they contained elevated levels of lead (1600 ppm). Previous sampling had found that the manholes upstream of the outfall contained elevated lead (up to 10,000 ppm). These soils are the likely source of the lead found in the soils collected from the geotextile. To prevent future releases plans are underway to remove the contaminated soils from the upstream manholes.

Environmental Surveillance Monitoring

In addition to SPDES monitoring, all discharges to Outfall 010 (CSF) are monitored quarterly for metals, volatile organic compounds (VOCs), and water chemistry parameters as part of BNL's Environmental Surveillance Program. In 2004, all inorganic parameters were within the NYS Ambient Water Quality Standards. Only common analytical laboratory contaminants such as acetone and methylene chloride were detected in the VOC samples collected at outfall 010 during 2004.

Recommendations

The following actions are recommended for 2005:

- The groundwater monitoring program will be maintained on its current semiannual schedule in accordance with NYSDEC license requirements.
- The air monitoring program will be maintained on its current schedule as required by the NYSDEC license.
- To reinforce the importance of the daily visible emissions monitoring requirement, a memo from the Environmental and Waste Management Services Division was distributed to all Senior Stationary Engineers to remind them of their responsibilities for making daily observations of visible emissions from Boilers 1A and 5 and the Central Steam Facility Supervisor reviewed the requirements of Plant Engineering Procedure No. O&M-CSF-018 with Senior Stationary Engineers.
- Develop a process or procedure for reducing the number of opacity exceedances.

- If residual oil with a sulfur content greater than 0.3% by weight is delivered, BNL should have a process or procedure to blend this oil with Number 2 fuel oil to lower the sulfur content to 0.3% by weight.
- Continue SPDES monitoring.

References

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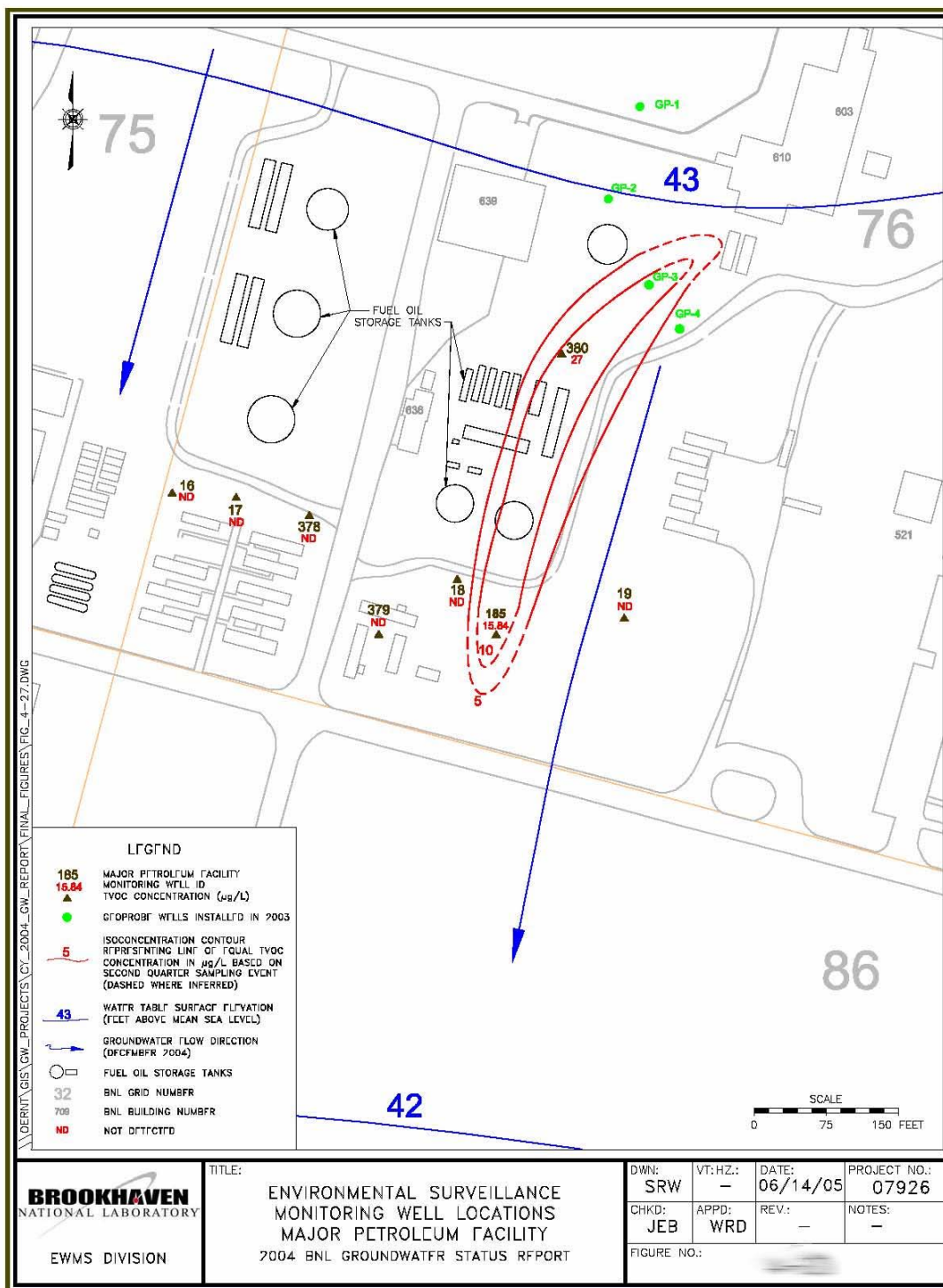


Figure 1. Locations of BNL Groundwater Monitoring Wells at the MPF.

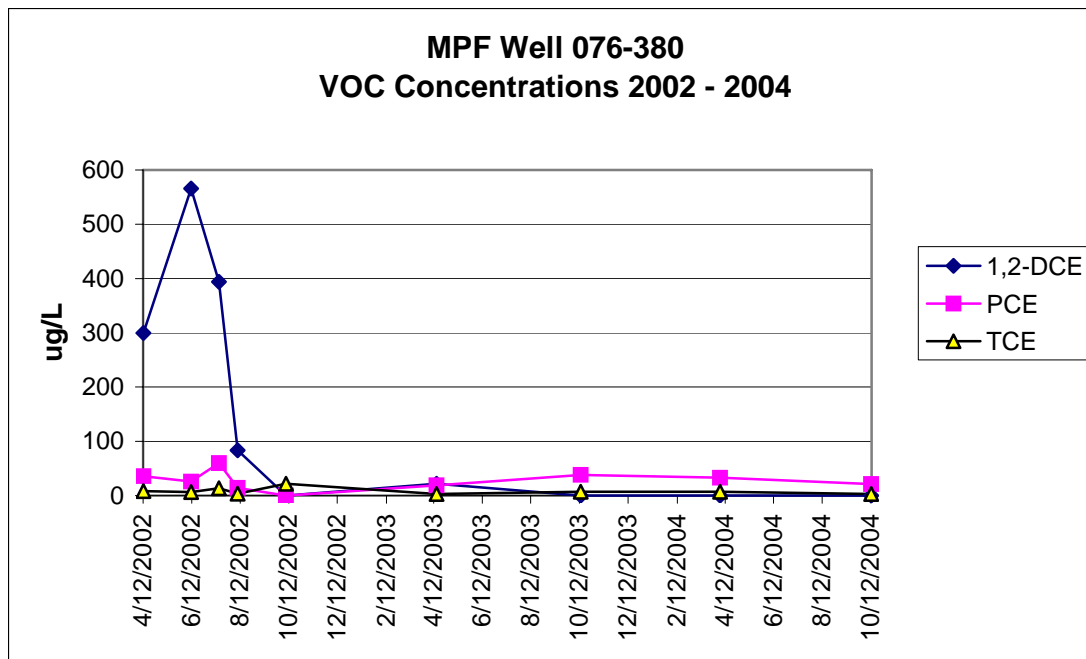


Figure 2: Trend of VOC Concentrations in MPF Well 076-380 during 2002 - 2004.

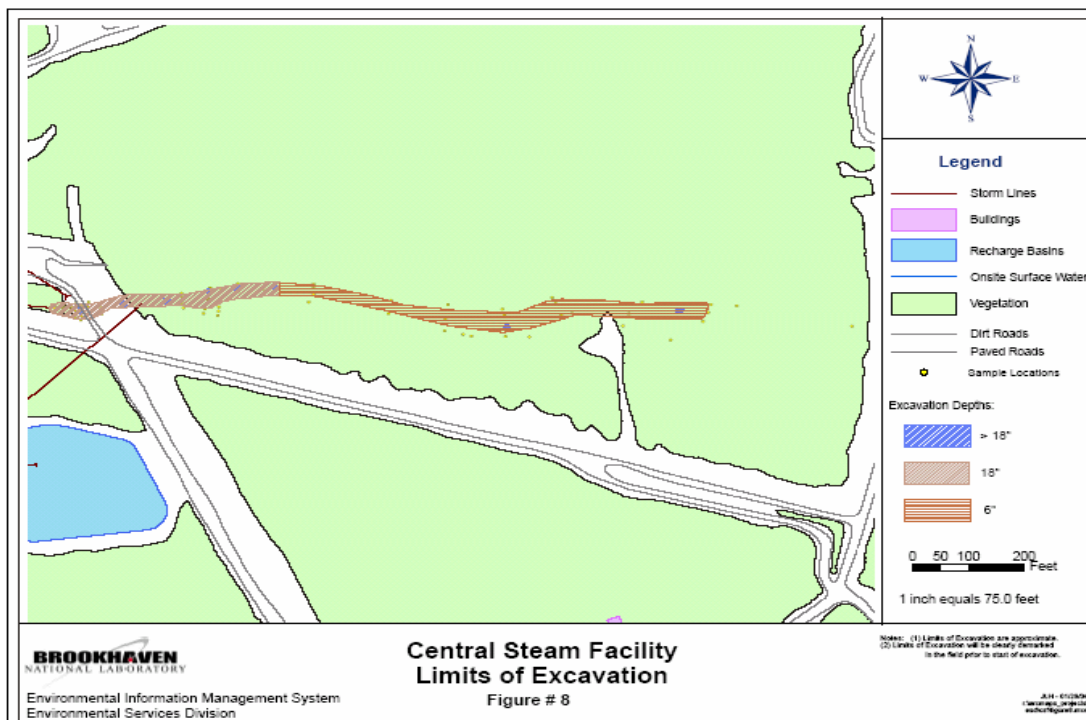


Figure 3: Extent of lead contaminated soils requiring cleanup at the CSF storm water outfall.